Helminths of the Ezo Brown Frog, *Rana pirica* (Ranidae), from Hokkaido Island, Japan[1]

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Abstract: *Rana pirica* Matsui, endemic to Hokkaido Island, Japan, was examined for helminths. One species of Monogenea, *Polystoma ozakii;* three species of Nematoda, *Cosmocercoides pulcher*, *Oswaldocruzia socialis*, and *Rhabdias nipponica;* and one species of Acanthocephala, *Acanthocephalus lucidus*, were found. *Rana pirica* represents a new host record and Hokkaido Island a new locality record for *O. socialis*, *R. nipponica*, and *A. lucidus*. None of the helminths found in this study is restricted to Hokkaido Island.

THE EZO BROWN FROG, *Rana pirica* Matsui, 1991, is endemic to and the only anuran on Hokkaido Island, Japan, where it lives from plains to montane regions up to 2000 m (Maeda and Matsui 1999). However, the salamanders *Hynobius retardatus* Dunn, 1923, and *Salamandrella keyserlingii* Dybowski, 1870, also occur on Hokkaido Island (Frost 1985). The only previous report of anuran helminths on Hokkaido Island was by Uchida et al. (1988) of the monogenean *Polystoma ezoensis* Uchida, Machida, Uchida and Itagaki, 1988, from *Rana chensinensis* Kawamura, 1962. *Rana chensinensis* from Hokkaido Island is a synonym of *R. pirica* (see Matsui 1991), and *Polystoma ezoensis* is a synonym of *P. ozakii* Price, 1939 (see Goldberg and Bursey 2002). In this article we report additional helminths from *R. pirica*.

MATERIALS AND METHODS

Eighteen *Rana pirica* (snout-vent length = 29.7 mm ± 14.1 SD, range = 17–53 mm) were collected by hand on 4 July 2001 at the Yukomambetsu River, Asahidake Onsen, ca. 1010 m elevation, Higashikawa-machi, Kamikawa-gun (43° 38′ N, 142° 48′ E), Hokkaido Prefecture, Hokkaido Island, Japan. Frogs were fixed in 10% neutral buffered formalin and preserved in 70% ethanol for a month. In August 2001 they were examined for helminths. The body cavity was opened by a longitudinal incision from throat to vent. The lungs, bladder, and digestive tract were removed, opened longitudinally, and examined under a dissecting scope. The body cavity was also examined. Helminths were removed, placed on a glass slide in a drop of undiluted glycerol, covered with a coverslip, and examined under a compound microscope. Nematodes were identified from the glycerol slides; monogeneans and acanthocephalans were regressively stained in Delafield's hematoxylin, mounted in Canada balsam, and identified. Frogs were deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, as LACM 147874–147891.

RESULTS

One species of Monogenea, *Polystoma ozakii;* three species of Nematoda, *Cosmocercoides pulcher* Wilkie, 1930, *Oswaldocruzia socialis* Morishita, 1926, and *Rhabdias nipponica* Yamaguti, 1935; and one species of Acanthocephala, *Acanthocephalus lucidus* Van Cleave, 1925, were found.

Helminths were placed in vials of 70% ethanol and deposited in the United States National Parasite Collection (USNPC) as *Poly-*

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TABLE 1

Infection Site, Number of Helminths, Prevalence, Mean Intensity ±1 SD, and Range for Helminths from 18 *Rana pirica* from Hokkaido Island, Japan

Helminth	Infection site	No. of Helminths	Prevalence (%)	Mean Intensity ±1 SD	Range
Monogenea					
Polystoma ozakii	Urinary bladder	1	6	1	—
Nematoda					
Cosmocercoides pulcher	Small, large intestines	9	22	2.3 ± 1.9	1–5
Oswaldocruzia socialis	Stomach, small intestine	58	44	7.3 ± 5.1	1–13
Rhabdias nipponica	Lung	48	78	3.4 ± 4.1	1–16
Acanthocephala					
Acanthocephalus lucidus	Small intestine	84	67	7.0 ± 5.1	1–17

stoma ozakii, 92107; *Cosmocercoides pulcher*, 92108; *Oswaldocruzia socialis*, 92109; *Rhabdias nipponica*, 92110; *Acanthocephalus lucidus*, 92111. Infection site, numbers of helminths, prevalence, mean intensity ±1 SD, and range for helminths are given in Table 1.

DISCUSSION

None of the helminths found in this study is restricted to Hokkaido Island. *Polystoma ozakii* was originally identified as *P. intergerrium* from *Rana ornativentris* collected on Honshu Island, Japan (Ozaki 1935) and later described by Price (1939). It has also been reported from *Rana japonica* (Uchida et al. 1988) collected on Honshu Island. *Cosmocercoides pulcher*, originally described from *Rana japonica* collected on Honshu Island, Japan, by Wilkie (1930), is known from anurans from Borneo, Japan, Okinawa, Russia, and Taiwan: *Bufo bankorensis*, *B. bufo*, *B. gargarizans*, *B. raddei*, *Chirixalus eiffingeri*, *Rana amurensis*, *Rana holsti*, *Rana ishikawae*, *Rana swinhoana*, *Rana ornativentris*, *Polypedates leucomystax* (Goldberg and Bursey 2002). *Oswaldocruzia socialis*, originally described from *Rana japonica* collected on Honshu Island by Morishita (1926), is known from Japanese anurans *Bufo japonicus*, *Rana nigromaculata*, *R. ornativentris*, *R. tagoi*, *Rhacophorus arboreus*, *R. schlegelii* and the lacertid lizard *Takydromus tachydromoides* from Honshu Island, Japan (Goldberg and Bursey 2002). *Rhabdias nipponica*, originally described from *Rana rugosa* collected on Honshu Island by Yamaguti (1935), is known from anurans from China, Japan, and Vietnam: *Buergeria buergeri*, *Hyla japonica*, *Rana guentheri*, *R. japonica*, *R. limnocharis*, *R. narina*, *R. nigromaculata*, *R. ornativentris*, *R. tagoi* (Goldberg and Bursey 2002). *Acanthocephalus lucidus*, orginally described from *Rana japonica* collected on Honshu Island by Van Cleave (1925), has been reported from Japanese anurans *Buergeria buergeri*, *Rana nigromaculata*, *R. ornativentris*, *R. porosa*, *R. rugosa*, *R. tagoi;* salamanders *Andrias japonicus*, *Hynobius retardatus;* lizard *Takydromus tachydromoides;* and snake *Elaphe quadrivirgata* (Goldberg and Bursey 2002). In view of the distribution patterns of these helminths as well as the close proximity of Hokkaido Island to Honshu Island, Japan, it is not surprising that the same species of helminths occur on both islands.

Literature Cited

Frost, D. R., ed. 1985. Amphibian species of the world: A taxonomic and geographical reference. Allen Press and Association of Systematics Collections, Lawrence, Kansas.

Goldberg, S. R., and C. R. Bursey. 2002. Helminths of ten species of anurans from Honshu Island, Japan. Comp. Parasitol. 69:162–176.

Maeda, N., and M. Matsui. 1999. Frogs and

toads of Japan. Rev. ed. Bun-Ichi Sogo Shuppan Co., Tokyo, Japan.

Matsui, M. 1991. Original description of the brown frog from Hokkaido, Japan (genus *Rana*). Jpn. J. Herpetol. 14:63–78.

Morishita, K. 1926. Studies on some nematode parasites of frogs and toads in Japan, with notes on their distribution and frequency. J. Fac. Sci., Imp. Univ. Tokyo 1:1–32.

Ozaki, Y. 1935. Studies on the frog-trematode *Diplorchis ranae*. I. Morphology of the adult form with a review of the family Polystomatidae. J. Sci. Hiroshima Univ., Ser. B 3:193–225.

Price, E. W. 1939. North American monogenetic trematodes. IV. The family Polystomatidae (Polystomatoidea). Proc. Helminthol. Soc. Wash. 6:80–92.

Uchida, A., M. Machida, K. Uchida, and H. Itagaki. 1988. Studies on the amphibian helminths in Japan (X) two new monogeneans, *Polystoma ozakii* n. sp. and *P. ezoensis* n. sp., and new locality and host of *P. racophori*. Bull. Azabu Univ. Vet. Med. 9:7–12.

Van Cleave, H. J. 1925. Acanthocephala from Japan. Parasitology 17:149–156.

Wilkie, J. S. 1930. Some parasitic nematodes from Japanese amphibia. Ann. Mag. Nat. Hist. (10th ser.) 6:606–614.

Yamaguti, S. 1935. Studies on the helminth fauna of Japan. Part 10. Amphibian nematodes. Jpn. J. Zool. 6:387–392.